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PROVINCE OF ALBERTA

DEPARTMENT OF LANDS AND MINES

NOTES ON
Placer Mining in Alberta

By D. B. REES

PUBLISHED BY AUTHORITY OF
THE DEPARTMENT OF LANDS AND MINES
EDMONTON, ALBERTA, APRIL, 1938

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Address all enquiries to

The Superintendent of Mining Lands, Department of Lands and Mines,
Edmonton, Alberta

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GOVERNMENT OF THE PROVINCE OF ALBERTA
DEPARTMENT OF LANDS AND MINES
MINING LANDS DIVISION

ELEMENTARY PLACER MINING IN ALBERTA

By D. B. Rees[1]

INTRODUCTION

The Department of Lands and Mines continues to receive repeated requests for information concerning placer mining, methods of recovery, manner of staking claims and other questions. It has, therefore, been deemed advisable to publish, in non-technical language, a pamphlet covering the principal questions asked mainly as an aid to the novice and to those who have little experience or technical training.

This pamphlet is by no means a treatise on placer mining. It is intended only to give simple, practical instructions and advice to the inexperienced placer prospector and miner, and more particularly to residents of the province who are better acquainted with conditions here, and who must live as cheaply as possible with at least some chance of partly supporting themselves.

No one should start out without sufficient funds or a proper grubstake to carry him through if necessary.

It must be borne in mind that the value of the gold recovered will vary with the energy, experience, equipment, location and to some degree the luck of each individual. The novice would be lucky indeed if he averaged 50c a day. This return is small but is usually enough to buy food and a little clothing; this, with the healthy nature of the work is some compensation.

[1] Assistant Superintendent of Mining Lands
Registered Professional Engineer.

OUTLOOK FOR SUCCESS OF SMALL PLACER OPERATIONS IN ALBERTA

Although the old saying that gold is where you find it is quite true the probability of finding it in paying quantities will be increased greatly if prospecting is done in areas geologically favourable for the occurrence of gold. The regions in which it is known to occur are naturally more favourable to prospecting than those where no gold has ever been produced.

To prospect for gold one should know first how to take care of oneself in the hills, mountains and remote areas. The prospector should be physically fit, able to stand hard work and know how to use a pick and shovel.

There have been no important new discoveries of gold placers in this province in recent years and it is unlikely that there will be. In parts of the country untouched by railways and highways, the streams generally afford the easiest avenues of travel and it is not likely that important placer deposits have been overlooked by the prospector (who always follows the stream) and by other travellers in these regions. It is quite possible that small and comparatively low-grade gold deposits still remain undiscovered and a search for them is a laudable effort. The experienced prospectors have the better chances of success. There is little chance for men unused to hardship and lacking experience in ''roughing it''.

The many attempts which have been made to rework the early placer deposits have not as a rule proved very profitable. This demonstrates the fact that old-timers knew their business, were thorough and left little behind which could be profitably worked by small-scale methods. It is quite possible, however, that during the years since the placers were first worked, shifting stream currents and the wave action on bank placers may have worked over the material and produced new local concentrations of gold. Such concentrations are apt to be small and scattered and the search for them long and arduous. In spite of the low grade of material left behind by the early miners, the best opportunity for the novice to pan wages would still seem to be in the districts in or adjoining old workings.

A few experienced placer miners, aided by the element of good luck, are probably doing very well at small scale placer mining, but the vast majority are probably not averaging one dollar a day.

The results of placer gold prospecting carried out along the rivers in Alberta in recent years seem to have indicated that what placer gold there is is concentrated on the surface. Concentration is so scattered and the size so minute that it is difficult to recover. The flour gold found in the larger rivers runs 500 to 900 colours to the cent and is such as would pass through a 400 mesh screen. To recover this type of gold ordinary hand methods are not profitable and generally speaking power methods have to be employed capable of handling a large yardage at low cost. Recovery is not likely to exceed 75% of the gold.

It should be remembered that the rights of private ownership must be respected and entrance on another's land for the purpose of mining can only be done by the consent of the owner, or consent of the Court.

ORIGIN OF PLACER DEPOSITS

A lengthy discussion of the origin of placers and their occurrence is beyond the scope of the present paper. Some knowledge of these subjects is essential, however, to intelligently search for and operate placers. Although other valuable substances than gold, such as platinum, tin, gems and minerals of the rare metals are found in placers, the present paper deals exclusively with gold placer.

All streams from the smallest rill to the greatest river are continually engaged in transporting downstream solid particles of rock, the product of weathering agencies in the areas which they drain. Since the capacity of a stream to carry matter in suspension is proportional to its velocity, it follows that any circumstances tending to retard the rate of flow will induce deposition. Thus a fall in the gradient at any point in the course of a stream; a snag, projection or dam, impeding the current; the reduced velocity caused by the overflowing of streams in flood and the dissipation of their energy where they enter a lake are all contributing causes to alluviation or the deposition of stream-borne sediment. In some regions alluvial deposits are the resting places of gold, platinum and gem stones.

Placers result from the disintegration of rock containing gold. Throughout the ages primary gold ores contained in veins, etc., are eroded away at the surface principally by running water. The gold bearing rock is broken up and the lighter and finer material is quickly washed out and carried away, while the heavier material including the gold is deposited in the stream's channel in places where the velocity of the water is sufficiently reduced. Obviously the largest and heaviest material will be deposited first; that is nearest its source in the lode and the lighter and finer material wlll be carried farther. Gold transported along gravel tends to sink down through the gravel to the bottom of the stream bed and to remain in crevices or other irregular openings or on an impervious layer of clay or other material, which form a false bedrock. Flour gold, however, may be transported in suspension in muddy water and is found in the form of bar-placers. It does not sink through the gravel to be concentrated on bed-rock, but forms thin pay-streaks in the gravel at about low water level. The pay-streaks are usually unevenly distributed and generally occur on the up-stream side of bars and at other places where alternate deposition or erosion has taken place.

CLASSIFICATION OF PLACER DEPOSITS

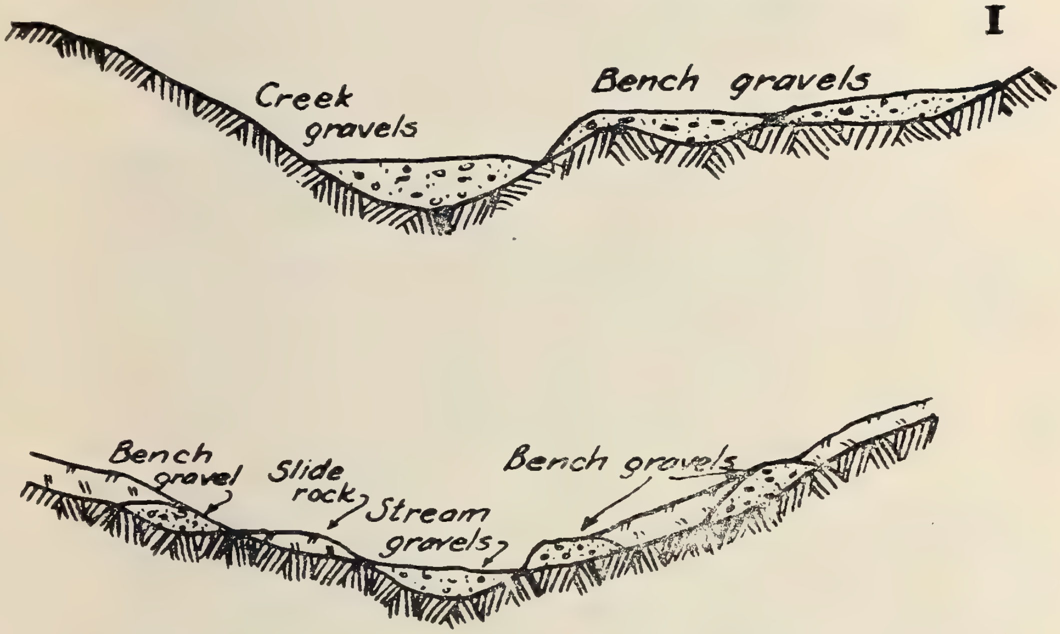
The amateur gold seeker will be chiefly interested in surface deposits rather than in deep seated or ancient buried river channel deposits.

The former may be divided into two general types, namely, residual placers in which the gold and decomposed rock are left in approximately their original location, and transported placers which result from the removal of the gold-bearing material from its original source, mainly by running water and its decomposition at some distant point.

Transported placers are the more important source of placer gold and these may be divided into the following classifications:

Creek placers:—Gravel deposits in the beds and flood planes of small streams and valleys. (Fig. 1). These are the most common and most productive. The gold is usually found in the lower few feet of the gravel, or, on and in the bedrock, in ponds and crevices. If a false bedrock of clay exists the gold may be found slightly embedded in the clay.

Bench placers:—Gravel deposits in ancient stream channels and flood planes which occur in benches or terraces fifty or a hundred feet above the present stream. (Fig. 1). They represent part of the stream bed during the early stages of the stream's development.



I

CREEK AND BENCH GRAVELS

River-bar placers:—Placers in gravel flats in or adjacent to the beds of original streams.

Lake-bed placers:—Placers accumulated in the beds of existing or ancient lakes that were formed by land slides or glacial damming.

Buried placers:—Another type of placer is the buried placer which results in the burial of placers of other types, usually "Creek Placers" beneath a heavy covering of gravel and sediment or of the flows of lava after the placer was formed. Some such placers have been worked profitably in British Columbia, the Western States and Alaska. They are usually worked by regular underground mining methods· the operations being termed "Drift Mining".

Size of Gold Particles:—The gold particles found in placer deposits vary greatly in size from large nuggets weighing pounds to fine flour gold requiring many hundreds to yield a value of 1 cent. The particles may be smooth and flat as the result of wear and pounding or they may be rough and ragged and attached to particles of quartz.

Associated Minerals:—Placer gold is usually found associated with "Black Sand" which is composed chiefly of magnetite, ilmenite and other heavy minerals.

The specific gravity of placer gold ranges from 15.6 to 19, while magnetite has a specific gravity of 5, so that placer gold is over 3 times as heavy as magnetite. Quartz has a specific gravity of 2.6.

It requires a little experience to readily distinguish gold from other minerals. The mineral that is most deceptive to the beginner is pyrites because of its yellow colour, but pyrites is very brittle and can be easily crushed. Gold, however, is malleable and when pounded simply flattens out without breaking. The faces of pyrites crystals usually reflect slight changes of colour when turned about in the light, whereas gold looks the same from all angles. Placer gold is sometimes covered with a film of iron oxide giving it a rusty appearance which hides the colour and character of the gold.

Distribution of Gold in Placers:—Gold is usually concentrated to a large extent on or just above the bed rock. Enriched pockets are apt to be found in trenches in the bed rock and if the rock is decomposed or fractured, gold will have settled in the cracks and crevices. It is, therefore essential in working to excavate to bed rock in every case and often it is necessary to take up the top few inches of bed rock to recover all the gold accumulated in the gravels. The presence of beds of clay or "hard pan" in placer deposits may have a marked influence on the deposition of gold. They form impervious layers on which concentration of gold takes place and act to prevent it from working below them. This does not mean that no gold will be found below such beds as it may have been deposited at lower horizons before the clay beds were formed.

HAND MINING METHODS AND SIMPLE EQUIPMENT

The methods may be classified on the basis of equipment employed, as follows:—

1. Panning,
2. Rocking,
3. Long Toms,
4. Sluicing,
5. Dry placer.

The amateur gold prospector should always carry the indispensable gold pan, a cheap magnifying glass and a magnet or knife with a magnetized blade.

PANNING

The first search for placer gold is generally made in stream beds, their bars and tributary gulches. The presence of valuable bench placers are usually discovered from showings disclosed in the stream above or below them.

The gold pan is an indispensable tool for prospecting either in a small or a large way. It is a circular dish made of sheet iron with sloping sides of a depth of two and one-half to three inches and ten to eighteen inches in diameter as shown in Fig. 2. For the recovery of a very fine gold such as is obtained in the North Saskatchewan River, a gold pan with a copper bottom is of advantage. Both copper and gold amalgamate readily with mercury and if mercury (quicksilver) is rubbed on the copper bottom, much of the fine gold which might otherwise be washed away will be retained by amalgamation with the mercury. The inner surface of the pan should be kept clean, bright and free from grease.

In prospecting a stream the prospector will pan the gravel at various points selected because of evidence of concentration of heavy minerals by the presence of black sands. Any exposure of bed rock along the stream will be carefully investigated, especially depressions therein, because gold and heavy sands will usually be found concentrated on bed rock. Excavation to bed rock will be made in the gravels of the stream bed and its bars and along its bank.

PANNING

Panning is a simple operation but requires a knack only developed by practice. The pan is filled about two-thirds full with the material to be tested, placed under water, mixed and kneaded with the hands, breaking up lumps of clay and other easily broken material. Rocks and pebbles are washed, picked out and discarded. The pan is raised to just below the surface of the water and shaken vigorously from side to side with a slightly circular motion which keeps the lighter material in suspension and works it out of the pan, which in the operations is slightly tilted away from the operator. The motion of the pan serves to concentrate the gold and heavy minerals around the edge of the bottom of the pan. The washing away of the lighter materials is made easier by alternately raising and lowering the far edge or lip of the pan above and below the surface of the water. The pan may occasionally be lifted entirely from the water and shaken vigorously with the same circular motion to hasten the concentration of the gold and heavier sands without the chance of some of the gold being washed out. The light material which rises to the top may be scraped off the edge of the pan with the thumb and the pebbles picked out. The panning is continued until only the gold and heaviest minerals remain in the pan. Toward the end of the operation it may be well to finish panning in a tub of water instead of in the stream, since any gold that may be inadvertently carried away may later be recovered by repanning the contents of the tub. The final product is dried and the black sand is removed with a magnet. The coarse gold may be picked out colour by colour and the fine gold may be recovered by amalgamation with mercury or by blowing the sands away from the gold by the aid of a small straw.

An experienced placer miner can carefully pan about one hundred pans in ten hours the exact amount depending upon the skill of the panner, the size of the gold, the extent to which the gravel is cemented and whether it is clayey or not. Roughly one hundred and eighty ordinary pans are equivalent to one cubic yard of material in place. A good panner can therefore work about 0.6 cubic yards a day and in order to make $4.00 a day the gravel would have to average about $8.00 a cubic yard. This would be considered very rich ground to-day.

In all small scale work, prospecting and actual mining, whether by panning, rocking or sluicing, are conducted together as one and the same operation. That is to say, the deposit is prospected as it is mined, the work being shifted from place to place according to disclosures made during the progress of the work; the results of panning are ordinarily used as a guide.

The gold pan is an important implement in the work of prospecting large deposits of low-grade placer material which may only be worked profitably by mechanical means involving large capital expenditures. A thorough preliminary prospecting of the deposit is essential and this may be done by means of test pits or drill holes depending upon the characteristics of the deposit and tests made by panning.

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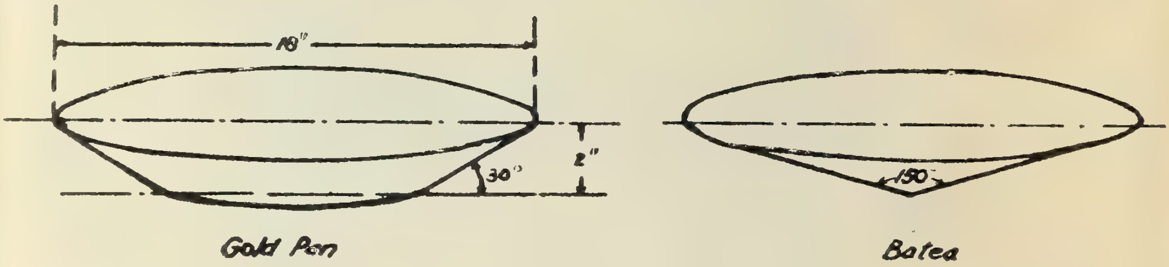


The batea is cone-shaped and is the equivalent of the pan. It is made of wood or sheet metal. They vary from 15 to 24 inches in diameter and have an angle of from 150 degrees to 155 degrees at the apex. (Fig. 2). It is claimed by many that wood will hold fine gold better than metal. The batea is in common use in Mexico, Central and South America and Asia.

A shallow wooden chopping bowl may be utilized as a substitute for a batea. This would be used in the same manner as a pan.

ROCKING

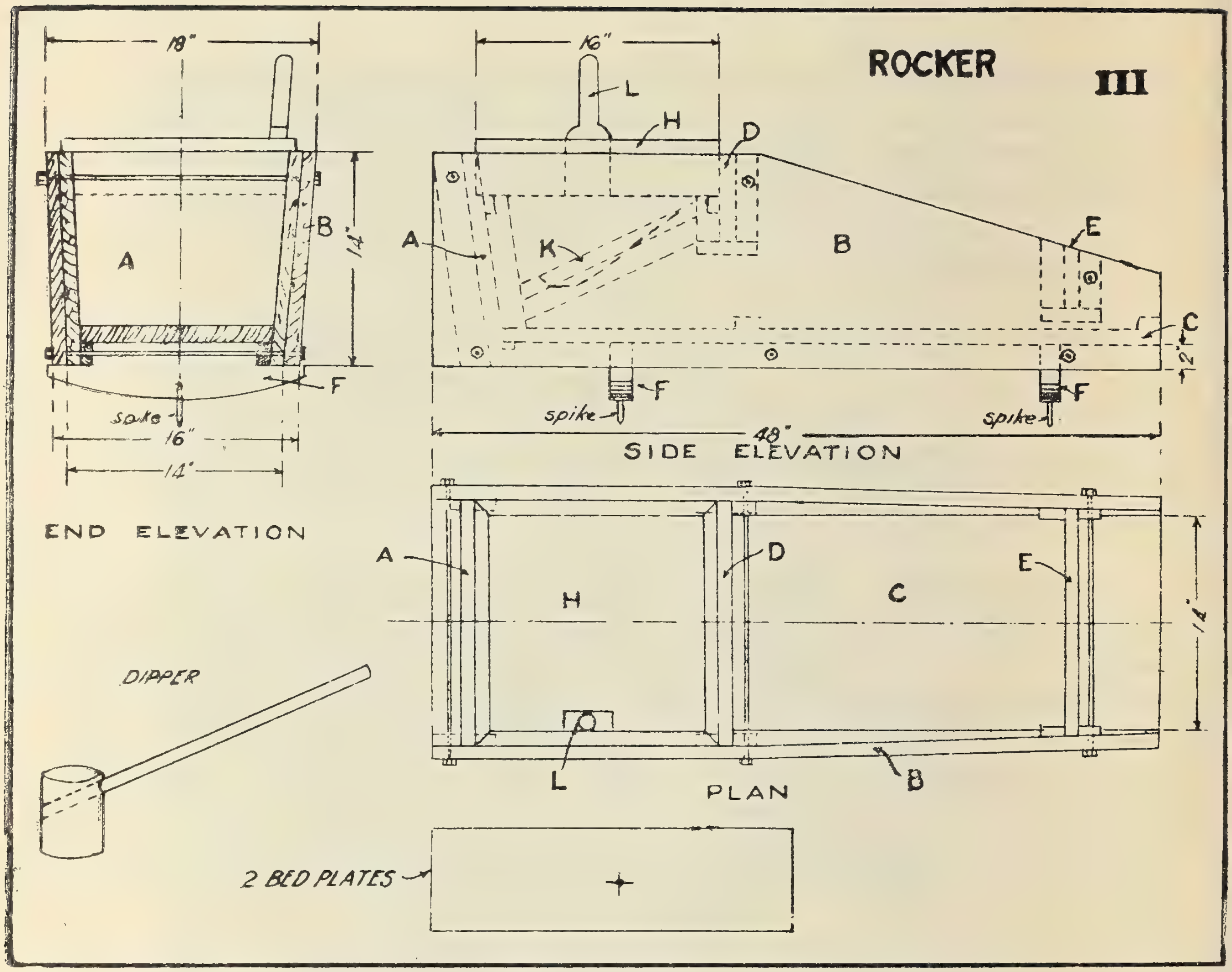
This method may be used by the small operator to increase substantially the amount of gravel which can be handled in a given time and the equipment required is little more than required for panning. A rocker may be operated by one man, but more efficiently by two, because one of them can be excavating and carrying the gravel while the other operates the rocker, turn and turn about. Two capable operators working steadily for ten hours will wash three to five cubic yards of gravel, the amount depending on the nature of the gravel, the distance it has to be carried, etc.

Figures 3, 4 and 5 are sketches giving details of construction of a rocker which is built so that it can be knocked down and carried from one location to another. The sieve box should fit loosely in the top of the rocker and the bottom of the sieve box should be made of heavy sheet iron punched with holes of one-half inch diameter.

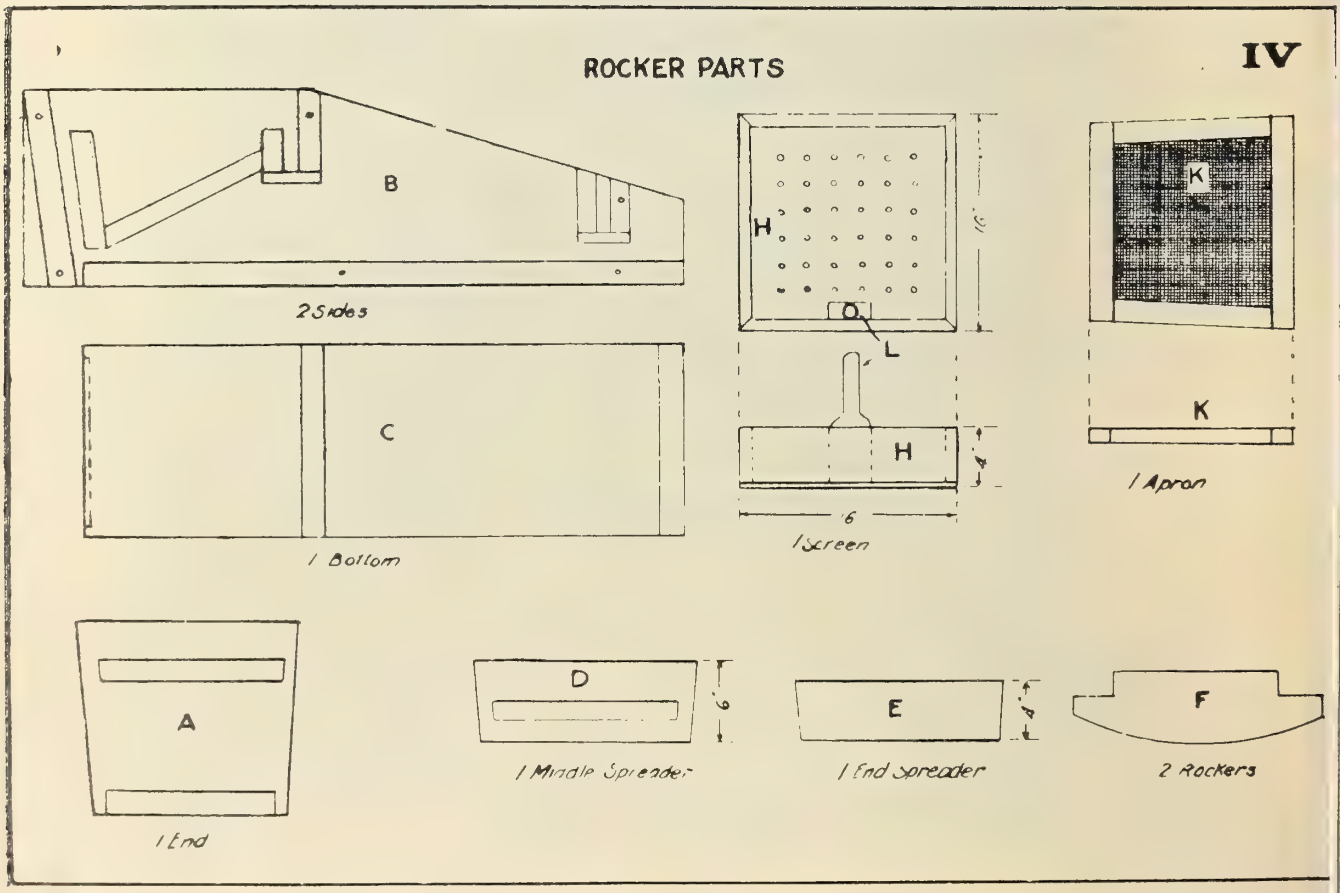
Construction:—Rockers are built in three distinct parts, consisting of a body or sluice box, a screen and an apron. The floor of the body holds the riffles in which the gold is caught. The screen catches the coarser materials and is a place where clay can be broken up to free it of all small particles of gold. The apron is to carry all material to the head of the rocker and being made of canvas stretched loosely over a frame has a pocket or low place on which coarse gold and black sands can be collected.

The accompanying drawing gives a suggestion for a knocked down rocker that can be built by anyone. The material required to construct it is given below:

A. End, one piece 1″x14″, 16″ long.
B. Sides, two pieces 1″x14″, 48″ long.
C. Bottom, one piece 1″x14″, 44″ long.
D. Middle spreader, one piece 1″x6″, 16″ long.
E. End spreader, one piece 1″x4″, 15″ long.
F. Rockers, two pieces 2″x5″, 17″ long.
H. Screen, about 16″ square outside dimensions with screen bottom. Four pieces of 1″x4″, 15¼″ long and one piece of screen 16″ square with ¼″ or ½″ openings or sheet metal perforated with similar sized openings.
K. Apron, made of 1″x2″ strips covered loosely with canvas. For cleat and apron, etc., 27 feet of 1″x2″ is needed. Six pieces of ⅜″ iron rod 19″ long threaded 2″ on each end and fitted with nuts and washers.



ROCKER III



ROCKER PARTS IV

L. The handle in the drawing is placed on the screen although some miners prefer it on the body. When on the screen it helps in lifting the screen from the body.

If 1″x14″ boards cannot be obtained clear flooring tightly fitted will serve, in which case about 12 feet of 1''x2'' cleats in addition to that above mentioned will be needed.

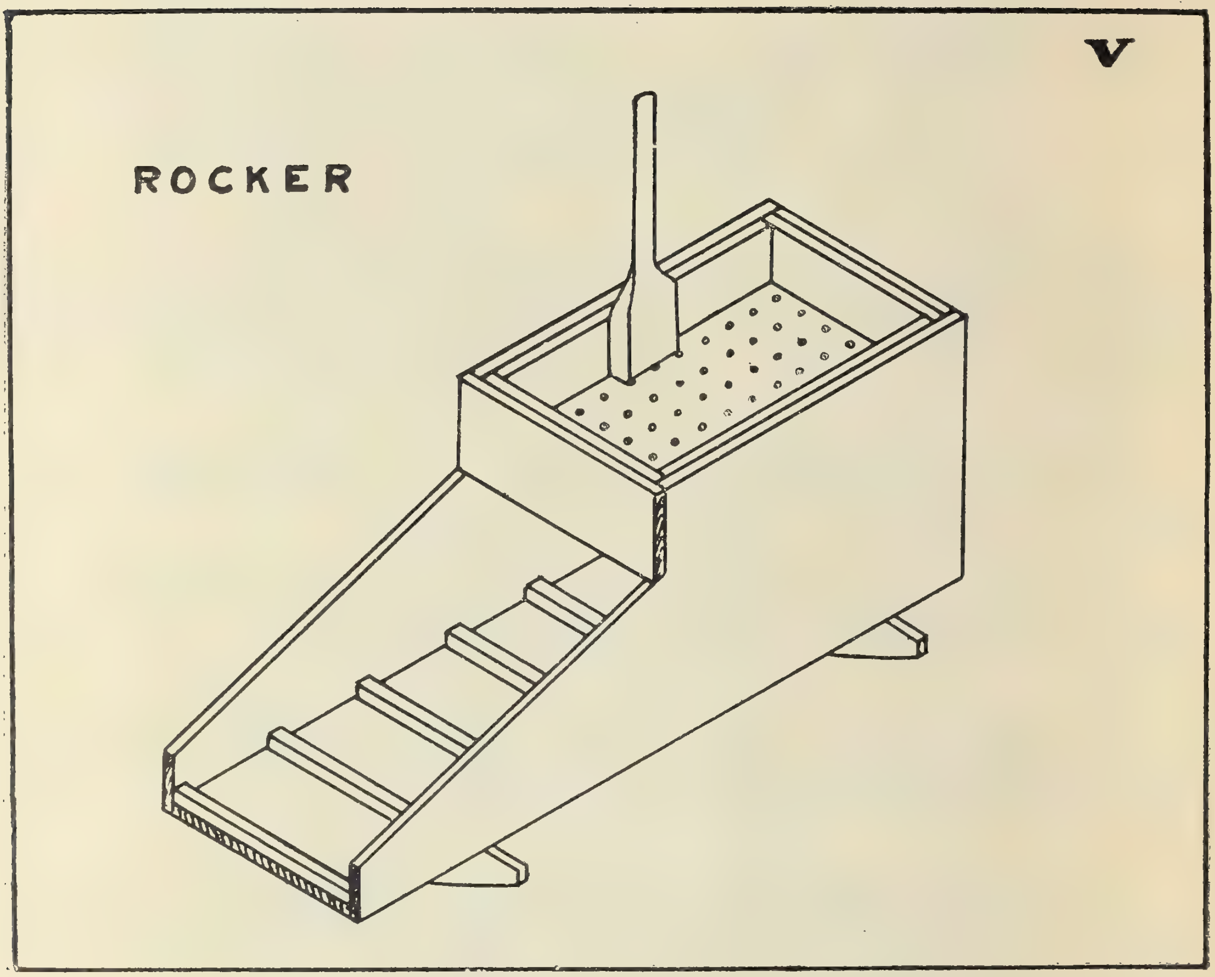
A dipper made of a tomato can (No. 2½ can) and 30 inches of broom handle is also necessary.

Through the centre of each of the rockers a spike is placed to prevent slipping when in operation.

In constructing riffles, it is advisable to build them in such a way that they may be easily removed, so that clean-ups can be made more readily.

Two planks about 2″x8″x24″ long with a hole in the centre to hold the spike in the rockers are also required. These are used as a bed for the rocker to work on and to adjust the slope of the bed of the rocker.

The rockers rest on heavy planks bored to receive the spikes. These planks are laid crosswise to the length of the rocker and are set in the ground so that the one at the left or front of the rocker in the illustration is about two inches lower than the other giving a drop of two inches in three feet. This grade should be adjusted, however, to suit the character of the material handled. Coarse gold is easily saved but very fine gold may be carried in suspension and pass through the rocker, therefore the grade or slope at which the rocker is set must be small if the material is clayey and the gold fine. To recover flour gold it is necessary to use a piece of blanket cloth instead of canvas for the apron and the lower lip may consist of a copper amalgamation plate on which mercury is rubbed to catch and retain the gold. It may also be necessary to add one or more riffles to the bed of the rocker.



Operation of the Rocker:—In operation the sieve-box is placed on the cleats and the gravel is shovelled into the box. the rocker is vigorously shaken back and forth with a jerky motion while water is being poured over the contents of the box in quantities and at a rate such as will thoroughly break up and remove lumps of clay and wash the gravel clean, yet not so rapidly as to carry away small gold particles over the riffles. The flow should be regulated to just carry the tailings over the riffles and the aim should be to get a steady flow rather than in waves or surges. It may be possible to achieve this by supplying the water to the rocker through a section of pipe or flume, though common practice is to dip the water with a can attached to the end of a stick and pour the water over the gravel as required. The water is handled by the man operating the rocker.

When the operators are near a stream the water supply is a simple matter but if the water is scarce or the placer is some distance from a stream the water must be conserved. This may be done by digging a pit at each end of the rocker, with a channel joining them, by this means the water may be re-used over and over again.

The heavy sands build up behind the riffles and when they reach the level of the top of the riffles, gold particles are likely to be washed over and lost. It is therefore necessary to watch the riffles and clean up the sands before they build up too high.

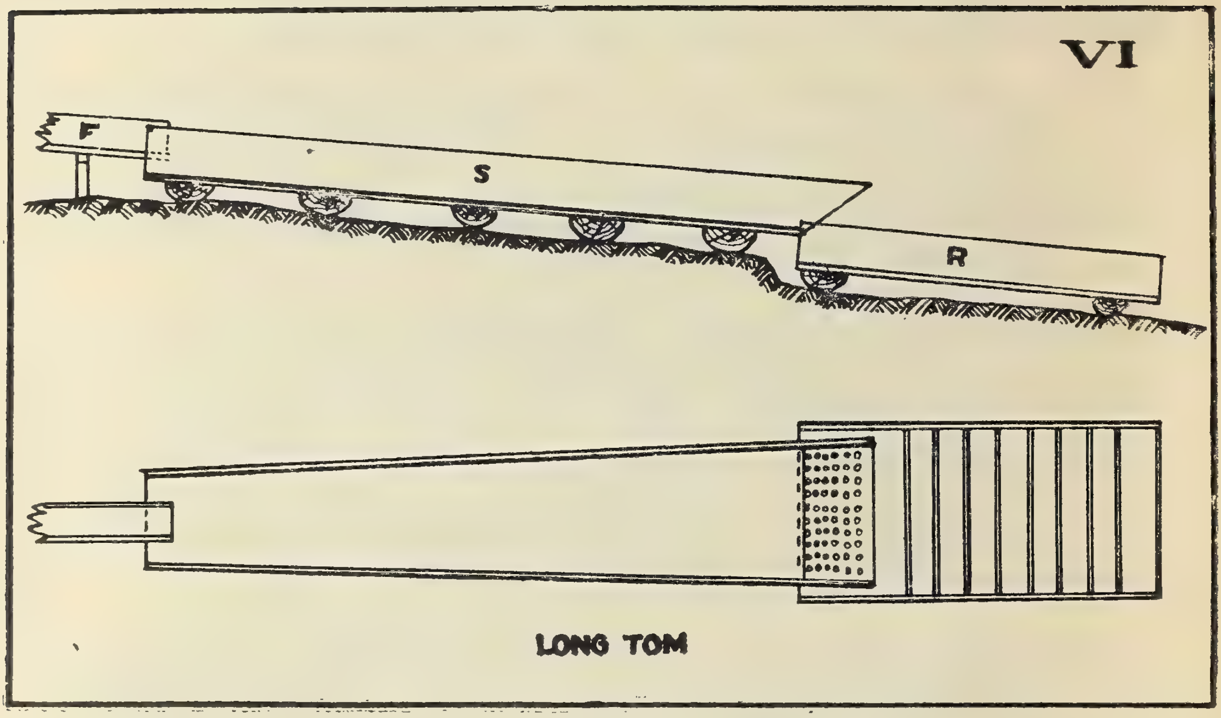
After the sand and clay has been washed away and the water coming through the sieve is clear, the contents of the sieve-box consisting of pebbles too large to pass through the perforations, are examined for any large nuggets that may be present and are then discarded. The sieve-box is then refilled with fresh gravel and the operation of rocking repeated.

Clean-up:—The apron of canvas or blanket is removed from the rocker and rinsed off in a tub of water and the sand behind the riffles is cleaned out as often as may be considered necessary. These concentrates are cleaned up by panning and sometimes mercury is used to clean up the very fine gold.

Even the best equipped rocker is not as efficient as the gold pan, but it can handle far more material than the pan in a given time.

LONG-TOM

This consists of an open box six to twelve feet long (Figure 6) with a perforated plate or screen (S) at the bottom into which the gravel and running water are introduced by means of a flume (F). The material passes through the screen openings which are usually one-half inch in diameter and drops on to a set of riffles placed in another box (R). The boxes are set on a slope varying from one to one and one-half inches to each foot in length. Two men are usually required, one shovelling in and the other operating the tom, but more may be employed. It is estimated that two men can handle from six to nine cubic yards of material in ten hours depending on the nature of the gravel and the water supply. To successfully operate a long-tom a good supply of water is essential and where this exists a simple sluice is just as effective and requires less labour.



VI

LONG TOM

Operation of Long-tom:—The gravel is shovelled into the tom or flume, the fine material is washed through the screen and the larger stones are forked out and discarded. The drop between boxes aids in breaking up the lumps of clay which may be in the gravel. The gold and heavy sands are caught behind riffles. When the riffles become filled up they are removed and the material which has been caught is cleaned by panning.

SLUICING

Sluicing is by far the commonest and most efficient means of mining placer or alluvial gold by hand methods.

It lends itself to a variety of forms and is capable of adaptation to a number of different natural conditions. The success of the operation depends upon a plentiful supply of water and the greatest efficiency is obtained where bed rock has a natural gradient of say four to five per cent.

Where a favourable natural slope does not exist handwork is not efficient and some mechanical means of handling the material becomes necessary.

Sluice boxes may readily be made of rough lumber, or lumber whipsawn or hewn from trees by the prospector. As a rule the boxes are twelve feet long, 12 to 18 inches wide and 8 to 12 inches deep. One end of each box may be made narrower than the other so that they may be joined by telescoping, but this is not necessary if watertight joints can be made.

The boxes may rest on the ground but as a rule they are elevated on trestles or on boulders to allow for disposal of tailings or waste and to maintain a grade of six inches to each twelve feet of sluice section.

Favourable conditions include a bed rock slope as steep as, or preferably steeper than, the desired grade of the sluices, plenty of room for disposal of tailings, sufficient water at all times to about half fill the boxes and a surface and bed rock contour which can be drained so that the shovellers will not be working in water.

The grade may be somewhat less if the gold is fine and the supply of water is large.

Riffles:—Riffles (Fig. 7) are obstacles placed along the bottom of a sluice to form pockets to catch the heavier sands containing the gold. There are numerous forms of riffle and several modifications of each form of which some of the best known are described in the following paragraphs.

Common or slat riffles are strips of wood or iron extending across the sluice box. Generally though, the abrasion is so great that replacement becomes necessary very often and other types are preferred in large scale operation.

Pole riffles are often used and these are 2″ to 4″ peeled poles placed either across or lengthwise with the sluice box. This type is very efficient with coarse material.

Block riffles are made to appear on the floor of the sluice box with wooden blocks cut across the grain and 4″ or more high, depending on the depth and width of the sluice. They are made in rows, nailed to slats which extend across the sluice. The blocks may be either square or round. This method of riffles is good for both coarse and fine material.

Rock or stone riffles are made by paving the floor of the box with rock and pebbles or flat stones quarried for the purpose. They are held in place by sticks of wood or slats nailed across the bottom of the sluice at intervals. This method is good for both coarse and fine material and particularly good for cemented gravel.

Zig-zag riffles are slats placed part way across the floor of the sluice box alternately from each side.

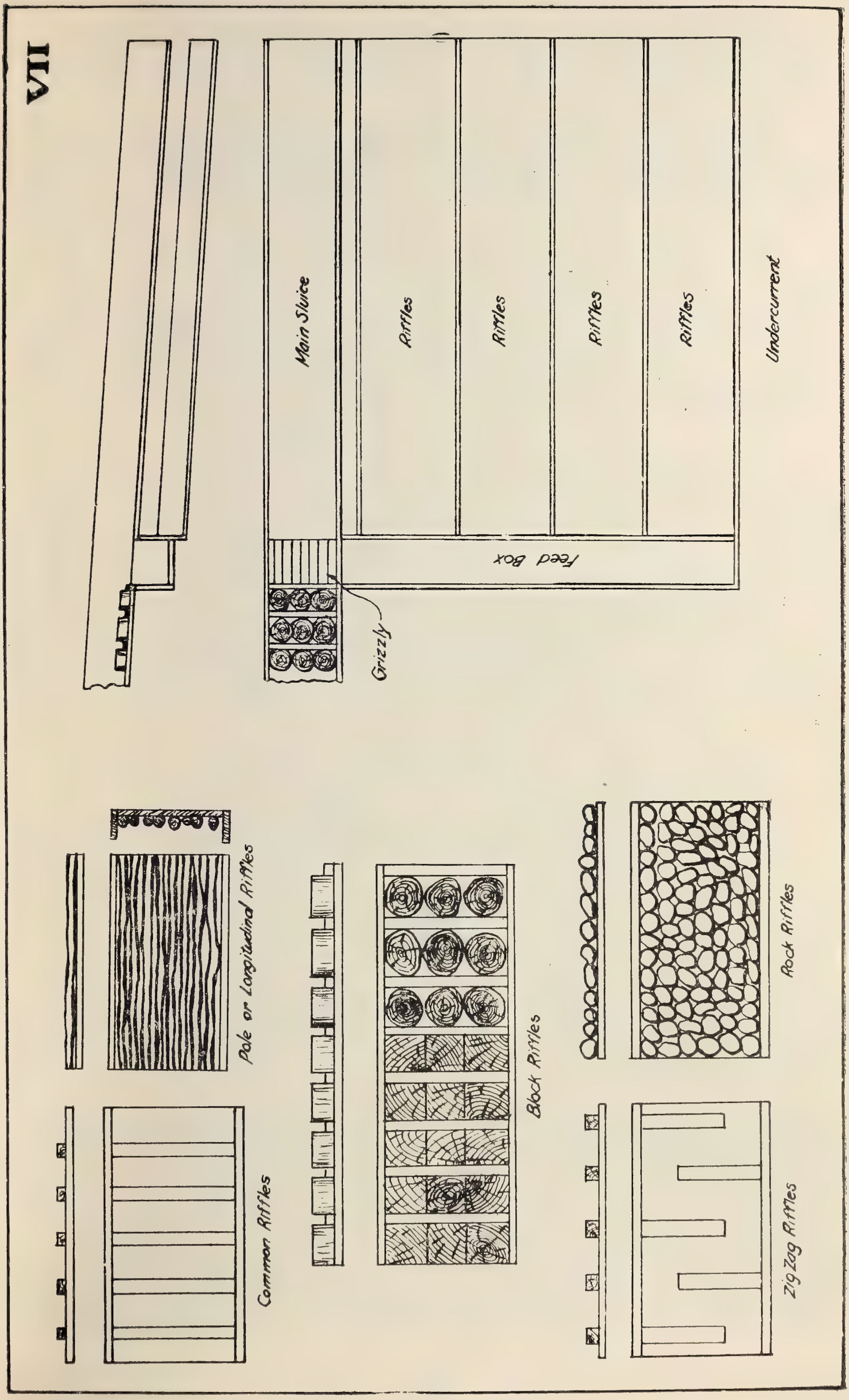
This type is particularly good for fine material and concentrates. For fine sand and gravel smaller riffles, carpets, blanket, burlap or cotton matting held down by expanded metal lath or riffles are sometimes used on the bottom of the sluice to collect fine gold. Occasionally mercury is placed behind the riffles near the discharge end or the fine material may be screened at the discharge end and made to pass over an amalgamating plate or under a burlap table in order to catch the fine gold. Riffles should not be permanently secured but wedged in because it is necessary to remove them for the clean-up.

An undercurrent is a wide flat sluice placed beneath the main sluice box and used for the purpose of saving the fine gold. They may be constructed 5 to 20 times as wide as the main sluice and from 10 to 50 feet long. They receive the feed through a grizzly on screen placed on the floor of the main sluice box from which the fine material drops into a trough which distributes the feed evenly across the whole width of the undercurrent. Generally the undercurrent has a slightly greater incline than the main sluice.

Operation of Sluicing:—The gravel to be washed is introduced to the sluice through a head-box equipped with a grizzly (bar-screen) made of poles, iron bars or pipes. The width of the spacing between the grizzly-bars will be governed by the size of gravel and if the gravel is very fine a perforated screen may be used. If the boulders are first picked off a grizzly may not even be necessary.

Water is usually supplied to the head of the sluice by a pipe or flume and is introduced to about half-fill the boxes

VII


Main Sluice
Riffles
Riffles
Riffles
Riffles
Undercurrent
Feed Box
Grizzly
Common Riffles
Pole or Longitudinal Riffles
Block Riffles
Zig Zag Riffles
Rock Riffles

and allowed to flow carrying the gravel through and out of the system of sluices.

With coarse material a narrow, deep sluice is most effective whereas fine material containing fine gold requires a shallow wide sluice set on a comparatively steep grade.

The sluices should be long enough to allow of the material being sufficiently disintegrated to free the gold. The proper length may be learned by testing the yield from the lower boxes and the sluices should be lengthened as long as this yield exceeds the cost of installing and operating.

For loose gravel a length of 100 to 300 feet is required, although short sluices with drops and undercurrents are often more efficient and easier to handle than the long sluices. A drop is a vertical fall between two sections of the sluice. An undercurrent is a wide sluice set on a heavy grade to one side and below the main sluice, which is fed with fine sand and gravel through an appropriate screen placed in the bottom of the sluice. It should be placed some distance from the head or intake end of the sluicing system.

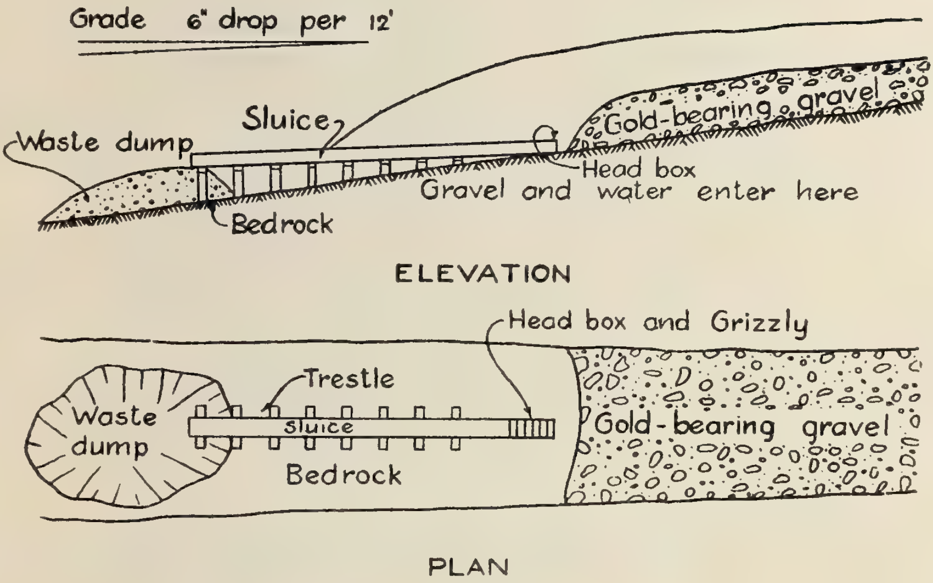
The following are some variations of sluicing:

Ground Sluicing:—In this method part of the waters of a stream are diverted to flow over or against a bank of gravel containing placer, eroding it away and washing it up to and through the sluice. Ground sluicing is particularly useful in stripping light overburden from pay gravel; pay deposits of considerable thickness can be handled in this manner if conditions are favourable such as plenty of water, fairly loose gravel and a favourable bed rock slope.

The quantity of water required is six times the amount necessary to do the same work in a box sluice. Frequently only the lighter materials can be moved by this method and the pay dirt that remains has to be handled by other methods such as, shovelling in, in cars, by scrapers or some mechanical means. Where the gradient is comparatively steep and there is plenty of water and conditions are such that it is possible to ground sluice to bed rock, and where the bed rock is rough and thus affords natural riffles, the gold and heavy sands may be found concentrated in the depressions in the surface from which it can be cleaned up by panning or rocking. Spring floods may sometimes be used to remove much of the overburden and the remaining material sluiced by shovelling in during the low water season. It is estimated that two men can move a maximum of twenty to thirty cubic yards a day by ground sluicing.

Booming:—This is a term given to a variation of ground sluicing in which the water is accumulated behind a dam and is released at intervals by hand or mechanically operated gates; the water rushes or "booms" down the cut, carrying the material with it.

IIIV



SLUICE LAYOUT FOR HANDWORK

Shovelling-in:—Shovelling-in is adaptable to rich placer gravel of a depth of from six to eight feet, or to gravel already partly concentrated by ground sluicing or booming (Fig. 8).

This method is the most general and consists of hand shovelling the material into sluices cleaning down to bed rock, picking out the boulders and stacking them on one side, disposing of the fine tailings from the sluices, cleaning up the riffles, and recovering the gold from the riffle concentrates.

The construction of sluices has already been described and the conditions favourable to sluicing have been outlined.

A saving of labour may be achieved by moving the sluice line close to the gravel bank and as the bank is cut away moving the sluice accordingly. If this procedure is found expensive because of the frequent delays while moving, a semi-permanent sluice may be constructed in a location central to the area to be worked, and the excavated gravel brought to the sluice in wheel barrows, scrapers or in cars on light rails.

In order to obtain sufficient grade for the sluice boxes and at the same time to have storage room for the tailings, it may be necessary to elevate the sluice to a height too great for shovelling in. Under such circumstances it will be necessary to load a skip at the foot of an incline and pull it up to the head box by means of a small hoist or loaded cars may be pulled up in this manner.

For shovelling into elevated sluices the maximum practical lift is six to eight feet and the amount of gravel a man can shovel in depends on the height of the lift, amount of picking to loosen gravel, the quantity of boulders, etc. An average day's work is seven to eight cubic yards per man.

Clean-up:—This operation may be carried out at regular intervals every few days or once a season depending upon the richness of the yield. Clear water is first run through the sluices until it is free of gravel. Beginning at the upper end, the riffles are removed section by section commencing at the head end of the sluice, while a small stream of water is kept running in the sluices to wash the lighter material to the section below. The gold, heavy sands and amalgam (if mercury has been used) are scraped up and placed in containers, and this material is afterward cleaned in a rocker or by panning.

As an aid to the recovery of fine gold in the sluice box it is customary to line the bottom with various materials. Those in common use are coco matting, carpet, blanket, burlap, canvas, cowhide with hair on, sponge rubber and similar materials. The materials are held down by cleats or wire netting so that they can be readily removed and the gold and black sand washed off in a tub for further cleaning.

If grease is present in some form, or the gold is coated with a film of clay or some other material such as iron oxide it will not amalgamate. It may sometimes be cleaned by giving the concentrates a wash of soda (soda ash) or lye.

Rusty or tarnished gold is somewhat difficult to save in the sluice box or to amalgamate. Amalgamation may be accomplished by grinding ''rusty'' gold to scour and brighten it so that it will be taken up on contact with the mercury. Such gold will also readily amalgamate in the presence of a solution of cyanide. Potassium or sodium cyanide solution attacks or dissolves gold and because of this its use must be well understood or loss of gold may occur. Cyanide is a deadly poison even in weak solutions and it should be handled with great care and should not be used by an inexperienced person. A piece of cyanide about the size of a small marble added to half a gallon of water will be sufficient to brighten ''rusty'' gold.

''Floured'' quicksilver can usually be made to reunite by the addition of a cyanide solution or by agitating it thoroughly with a very diluted nitric acid to clean it.

The final recovery of gold from a rocker, sluice box or other gold-saving device can often be reduced to a small bulk of concentrates of a few pounds by careful panning.

The following detailed information is given to illustrate the method generally employed to recover gold from a small amount of concentrates.

Place the small bulk of concentrates in a large bottle not more than one-fourth full, add water until it is about one-half full, and sufficient mercury, at least a teaspoonfull. A teaspoonful of lye might be added for cleaning purposes. While seated, slowly tip and roll the corked bottle back and forth on your lap. After doing this for about fifteen minutes all the gold should be amalgamated. The mass should now be emptied into a gold pan, more mercury added and the material panned until only a small amount of the concentrates cover the mercury. Hold the pan in a horizontal position and see that the mercury is in one mass, then with a rather quick tilting of the pan the gold bearing mercury can be poured off. Mercury if clean and active should not flour or form little globules, but should come off in one mass leaving little if any in the pan.

Now pour the clean gold-bearing mercury or amalgam into a wet chamois skin that has been laid over a cup in such a way as to form a pocket. The excess mercury is removed by straining it through the chamois by twisting the chamios down on to the mercury, like wringing water from a wet cloth,—what remains in the chamois is hard amalgam.

Some of the very fine particles of gold may also pass through the pores of the chamois, however, the amount will be small and it can be saved later by retorting. The prospector usually heats the hard amalgam on a shovel over a fire to drive off the mercury. This should be done out of doors because the fumes of mercury are very poisonous.

Power methods are sometimes used for successful low-cost operation when the placers are covered by a thick overburden or where the slope of the ground or of the bed rock is not suited to simple hand-sluicing methods.

The foregoing notes are admittedly sketched and reference should be made for full details to some of the standard books on the subject, such as:

1. ''Operating Gold Placers''—by W. F. Boericke, published by John Wiley and Son.

2. ''Hydraulic and Placer Mining''—by E. B. Wilson, published by John Wiley and Sons Inc., New York.

3. ''Hydraulicing''—by W. E. Thorne and A. W. Hooke, published by Mining Publications Limited, London, England.

4. ''Prospector's Handbook''—by W. L. Goodwin, published by the Industrial and Educational Publishing Co., Gardenvale, Quebec.

5. ''Minerals and How They Occur''—by Miller and Parsons, published by Copp-Clarke Company Limited, Toronto.

6. "Examination of Prospects"—by C. G. Gunther, published by McGraw-Hill Book Company, New York.

7. "Handbook for Prospectors" 2nd edition 1931—by M. W. Von Bernewitey, published by McGraw-Hill Book Co., Inc., New York.

8. "Prospector's Handbook, 1929"—by J. W. Anderson, published by D. Van Nostrand, New York.

PLACER MINING AREAS IN ALBERTA

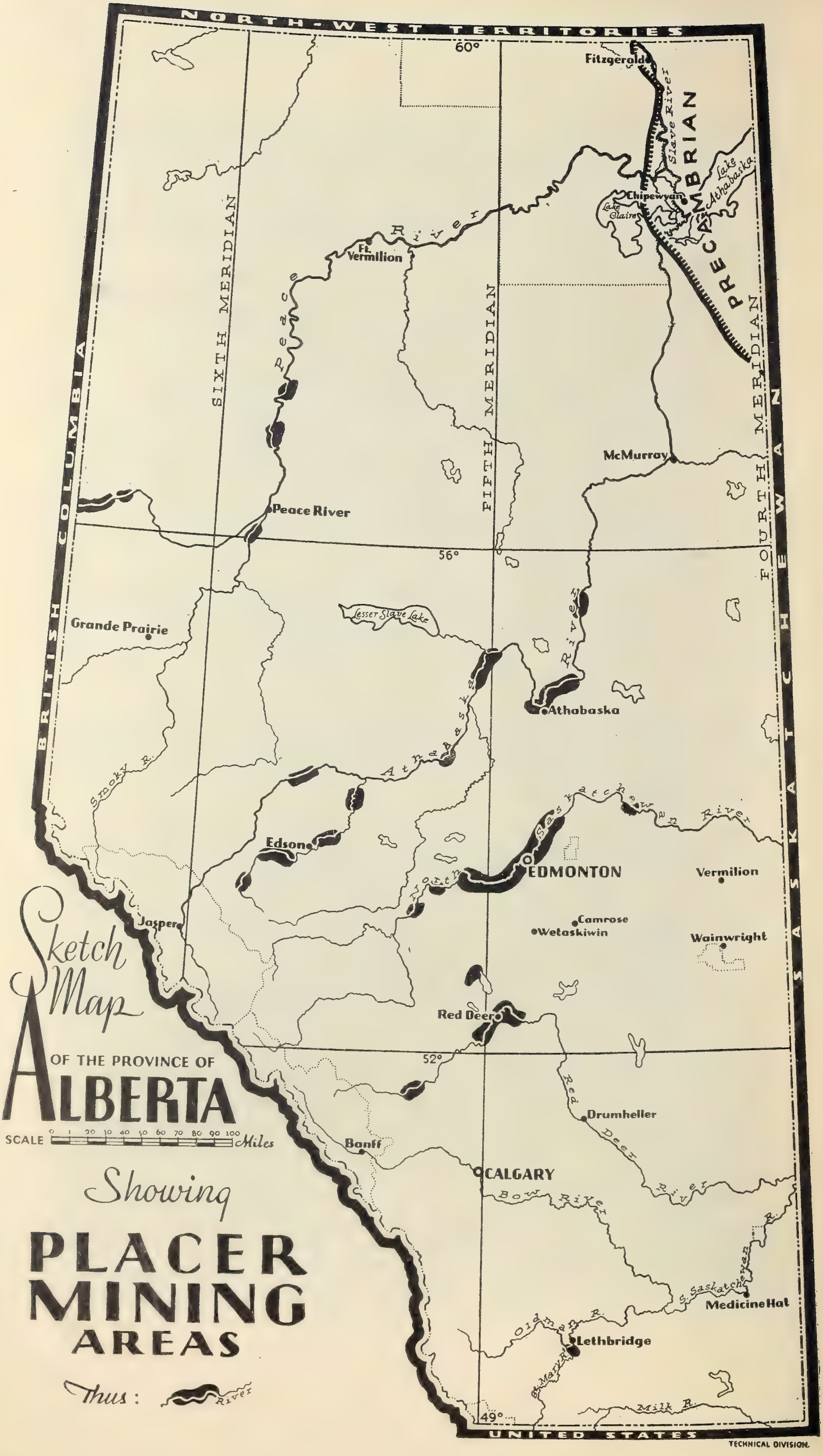
One of the most frequent questions asked is, "Where is the best place to go?" It is impossible to answer this question for many reasons not the least of which is that two parties working at opposite ends on the same river bar though perhaps only 100 yards apart may get entirely different results.

All that can be done in this paper is to give the general areas in which placer mining operations are apt to be most remunerative. These are shown on the outline map of the province on the next page.

Red Deer River:—There is some evidence of small deposits of flour gold usually in the upper sands below the upper faces of the gravel bars in the vicinity of the City of Red Deer.

McLeod River:—Along the river from below Hargwen to a point near Marlboro values have been found averaging 2 to 3 cents per cubic yard. From Rosevear to 6 miles below Peers Ferry will be found perhaps the best concentration on this river, more particularly in the old river channels. In these channels may be discovered areas where two or three layers of gold-bearing sands have been deposited one on top of the other and then subjected to wash. The resulting concentration which has occurred may yield values of flour gold up to 14 cents per cubic yard. These values however do not persist to depth. There is evidence of concentration in the upper gravels around Whitecourt and up the river 5 miles.

Saskatchewan River:—On this river the area of greatest placer mining activity is from south of the Town of Stony Plain to about fifteen miles down the river from Fort Saskatchewan. This area has been worked for the last seventy-five years. Today operations are chiefly



Sketch Map OF THE PROVINCE OF ALBERTA

Showing PLACER MINING AREAS

confined to gravel bars where the yield is flour gold found on the upstream end of gravel bars just below the surface gravel between high water and low water levels. The gold being fine and light does not sink to depth or penetrate back into the gravel bar but is confined to the first 3 or 4 feet. Some favourable bank deposits are being worked particularly in the vicinity of Fort Saskatchewan. These take a lot of finding and generally the overburden is thick and the cost of moving it greater than the yield in gold per cubic yard. Low water sometimes makes it difficult and costly to work a bank deposit. Some contend that Saskatchewan River water is greasy and special means of recovery have to be devised. The latter is true of all rivers and all deposits.

Athabaska River:—There is no great evidence of gold, until one reaches Fort Assiboine in township 62, range 6, west of the 5th meridian and very scattered deposits may be found from there to Smith in township 71, range 1, west of the 5th meridian. In the vicinity of Smith concentration in bank deposits has been known to yield 20 to 25 cents to the cubic yard.

Peace River:—The river bars are very interesting and the gold obtained runs from 450 to 700 colours to the cent. Near the Town of Peace River concentration has occurred in the bank gravels frequently 200 to 300 feet above normal water level. The gold found is quite thin and appears to be in the upper two feet or so of the gravel. Up on the banks, the water supply becomes a problem.

Generally speaking, the outlook in the province for the discovery of placers in paying quantities is very limited. What gold there is is very fine, and is generally concentrated in the upper gravels. No discoveries have been made on bed rock or in the false bed rock boulder clay which is generally found to exist. Efforts should therefore virtually be confined to bar diggings in the upper sands, the finds being in small deposits and very scattered.

ALBERTA PROVINCIAL GOVERNMENT RELIEF PLACER MINING CAMP, 1933

Various suggestions have been made regarding government aid to grubstake individuals for small scale hand placer mining. These proposals have been given sympathetic hearing and in the summer of 1933 a placer mining camp was established by the Unemployment Relief Commission to provide for single unemployed men.

To be succesful any organized movement involving the placing of a large body of men at such work would involve:—

1. An appropriation of money to cover the cost of equipment, camp, clothing, supervision and food for the men for 30 to 60 days.

2. Discovery of good gold-bearing deposits.

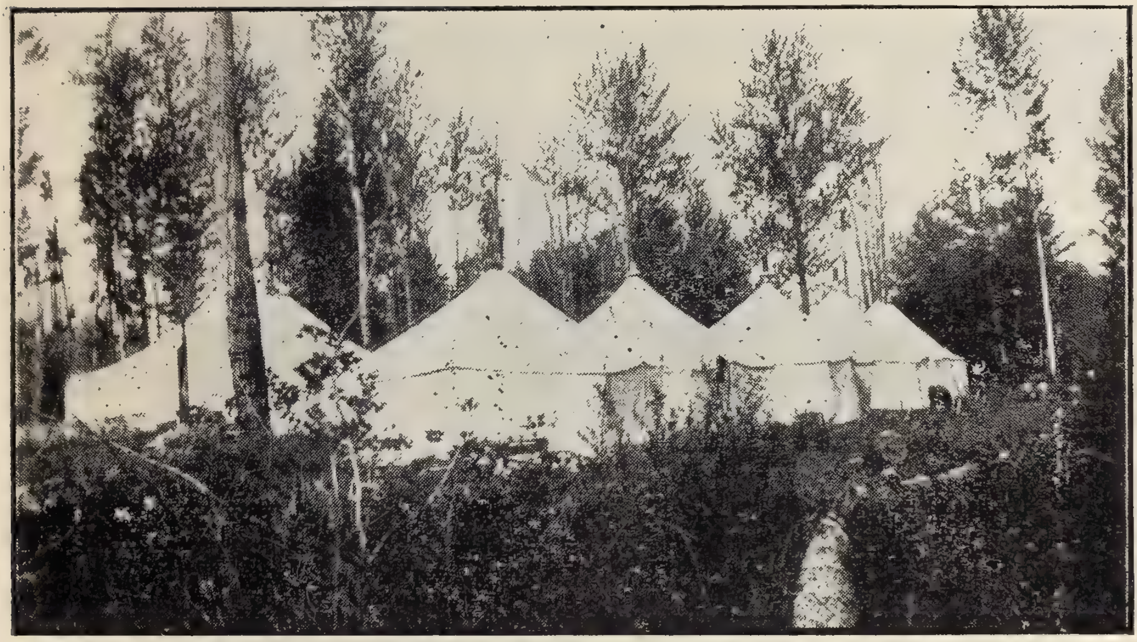
3. Organization of small groups of men under strict supervision led by experienced placer miners.

All these conditions were observed in establishing this camp and every effort was exerted to make the camp a success.

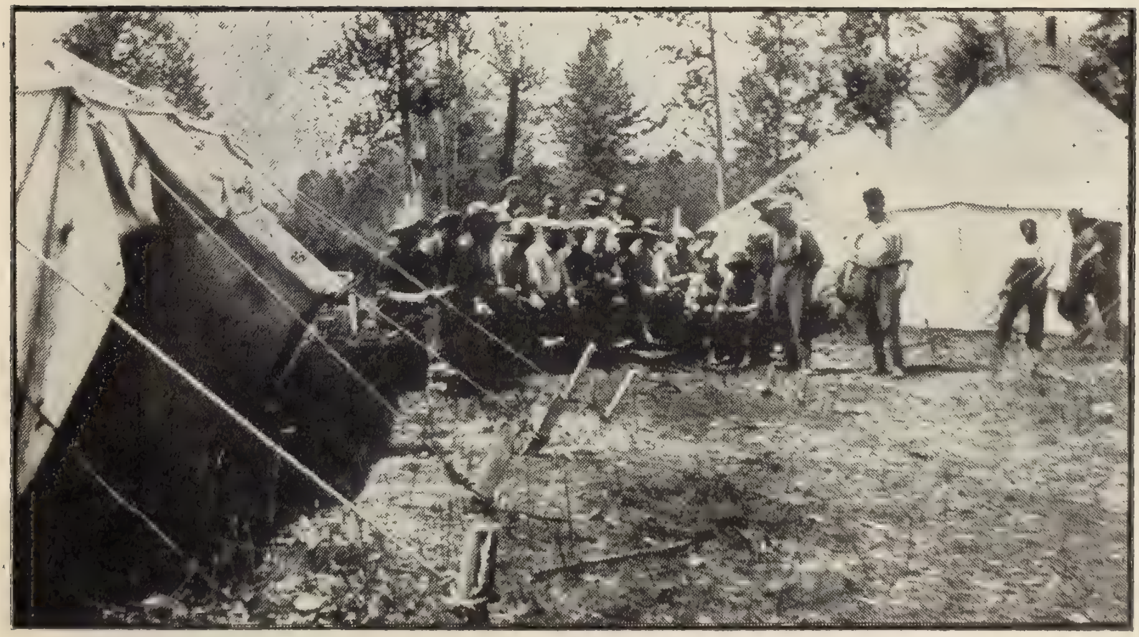
A favourable location was selected, recommended by the Geological Department of the University of Alberta. A tent camp was erected in a sheltered grove of trees on the river bank with all possible facilities including a good cook and cookhouse. Food, clothing and blankets were provided free, as also were sluice boxes and other equipment. Fifty selected men were installed in the camp under the supervision of a foreman and experienced placer miners. The men were divided into units of six men and each unit was allowed to keep the gold it recovered. All worked industriously on river bars within easy walking distance of camp in the month of June, under excellent conditions; good weather, but hampered somewhat by high water. The best returns obtained by a unit of six men for the whole month's work was $15.00.

The scheme was a failure and the camp was closed. Those of the men who wished it were given the equipment, sufficient clothing and a grub stake of ten dollars.

Unemployment Relief Commission
Placer Mining Camp, 1933
For Single Men



CAMP



GROUP OF FOREMAN AND WORKERS

Unemployment Relief Commission
Placer Mining Camp, 1933
For Single Men

A UNIT AT WORK

OPERATIONS AND EQUIPMENT

It is evident that to be successful in finding gold along the swift running rivers of Alberta a placer miner must either work alone or preferably with one companion. He should be a true prospector, a complete optimist, imbued with the unquenchable flame of hope, and so equipped as to be able to move himself, companion, all kit and equipment easily and quickly from one likely prospect to another.

MARKETING OF GOLD

The domestic price of gold has remained fixed at $20.67+ per fine ounce for over a hundred years.

In 1931 Great Britain went off the gold standard and the price of gold proceeded to advance month by month. The estimated yearly average value of an ounce of fine gold expressed in Canadian funds was $21.55 in 1931, $23.47 in 1932, $28.60 in 1933, $34.50 in 1934, $35.03 in 1935, 1936 and 1937.

Deposits of newly mined Canadian gold, containing not less than one ounce (troy) of fine gold may be bought by the Royal Canadian Mint, Ottawa, or the Dominion of Canada Assaying Office, Vancouver. The deposit may be in the form of retort sponge, lumps, nuggets, grains or dust free from earth and stone or nearly so. Payment is calculated at the rate of $1.00 for each 23.22 grains fine gold contained in a deposit (equivalent to $20.6718+ the ounce fine) as set by the Minister of Finance. If a deposit contains silver to a greater quantity than one per cent. of the weight after melting, the mint will pay for this at a rate to be set by the Minister of Finance. This price is generally very near to the current market price.

Native gold varies in fineness and it may take one and a half to two ounces of native gold to make one ounce of fine or pure gold. Retort sponge (gold amalgam with quicksilver expelled) must contain by assay more than 200 fines, that is, more than one-fifth pure gold or it may be rejected. Rejected deposits will be returned on payment of all the costs incurred for melting, assaying, etc.

The mint charges are:

(a) For Melting and Assaying—$1.00 for the first four hundred ounces or part thereof and twenty-five cents for each additional one hundred ounces or part thereof.

(b) For Refining—From three cents to ten cents per ounce, depending on the percentage of base metals which the deposit contains, ranging from five to twenty per cent.

The minimum charge for refining is $2.00 for each deposit.

Packages will not be opened until an invoice of the description and weight of the contents is received. All shipments must be fully prepaid and the postage on letters enclosing the invoice must be fully prepaid. If uncertain of the weight it should be stated that same are approximate and that the mint scales weight will be accepted. The rules governing the purchase of gold by the mint are subject to change without notice.

There are several private buyers, such as the banks, all manufacturing jewellers and several country stores. These private buyers, of course, do not pay the fine gold mint price, because they have to pay the cost of shipping, insurance, melting and refining charges; but as they will purchase small amounts the time and trouble of shipping to the mint is avoided, and for these reasons it is often advantageous to dispose of the gold through them.

There is no known market in the province for black sands.

PROSPECTORS' EQUIPMENT

Probably the commonest means of transport for the prospector in Alberta is by canoe and it is presumed that the reader can at least handle a canoe, pitch a tent and cook his own meals. He should also know how to read a map and understand the use of a pocket compass.

A few suggestions can be made to the man who is contemplating a prospecting trip and who has had but little bush experience. If he plans to finance his own venture and has not had much training he would be well advised to secure a competent companion or enlist the services of another like himself and to confine his search to areas that are close to the river or stream or fairly well marked by trail.

The following excellent list of necessary equiment has been recommended for the use of prospectors by the Ontario Department of Mines, which with the exception of purely personal effects should fully outfit two men for much of a season:

TRAVELLING AND CAMP EQUIPMENT

Canoe, 17′ Prospector model, used $30, new	$ 75.00
Tin of Jeffrey's marine glue for patching	.60
One tent, 7 by 10 feet, with wall (this should be silk if possible, thereby saving weight). Cotton duck $10.50; silk 7½′ by 9′ with 2′ walls (9¼ lbs.)	32.00
One canvas tarpaulin for tent floor	4.50
Three pairs of heavy woollen blankets	15.00
Two mosquito bars	2.50
Two pack sacks	8.00
Two pack sheets with tump lines	4.50
Fly oil (citronella mixture or oil of pine needles)	1.00
Fly Tox	1.00
Total	$144.10

COOKING UTENSILS

Two frying pans	$ 2.00
Nest of pails	6.00
Stirring spoon and fork	.50
One butcher knife	1.50
Four tin plates	.20
Four pannikins (tin cups without handles)	.60
Three each of knives, forks, teaspoons and tablespoons	1.00
Dish towels, two yards	.50
Fishing lines, trolls, etc.	2.00
Flashlight, extra cells and bulbs	2.00
First-aid kit, bandages, compresses, iodine, etc.	1.50
Total	$ 17.80

TOOLS

Shovels	$ 1.25
Mattocks (complete)	1.65
Two 2½ lb. axes	3.00
Saws, hand	1.95
Files	.25

Carborundum or whetstone (6 inch)	.50
Nails and spikes per pound	.06
Gold pan	1.50
Total	$10.16

PROVISIONS FOR TWO MEN FOR ONE MONTH

50	lb. flour
40	lb. bacon and pork (long clear)
6	lb. butter
6	lb. beans
4	lb. rice
2	lb. raisins
3	lb. cornmeal
6	lb. rolled oats
3½	lb. bag of salt
1	can pepper
2	doz. candles (short)
2	lb. tea
½	gal. or 10 lb. tin of corn syrup
2	lb. coffee or cocoa
1	lb. baking powder
3	lb. dried apples
3	lb. dried peaches
3	lb. dried prunes
3	lb. dried apricots
30	lb, sugar
1	doz. soup tablets
1	doz. Oxo cubes
1	lb. pot barley
1	lb. split peas
2	tins dessicated potatoes
30	small cans evaporated cream, or equivalent of powdered milk
	Abundant supply of matches.

The weight of the above would be approximately 200 pounds, and the cost, depending on locality, from $25.00 to $30.00. Outfitters in the North will put these supplies in cotton bags of various sizes with tie strings attached—a necessary convenience for packing. Paper bags are useless.

PERSONAL EQUIPMENT

Each man should carry his own watch, compass, waterproof match box, magnifying glass and hunting knife	$ 5.00

Clothing should be reduced to the minimum in order to save space and weight. The following quantity per man will be ample for a summer's work:—

Heavy khaki shirt and pants	5.00
Extra shirt	2.00
One light sweater coat, woollen	3.00
3 pairs woollen socks	1.50

2 suits woollen underwear	6.06
Hobnailed boots	8.00
Light canvas shoes for camp	1.50
Towel and soap, razor, metal mirror	2.00
Total	$34.00

The total cost of the above items is $236.06. Therefore the sum of $250.00 apart from rail or motoring fare would see two men outfitted completely and on the trail, bound for some likely prospecting ground. When claims are staked there will be the added expenses of railway transportation, recording fees, and incidental living expenses.

It may be timely to offer a few suggestions concerning some of the items of equipment.

Canoes and Paddles.—Most prospectors favour a canoe 17 feet in length particularly if large waters have to be navigated. The "belly" should be well pronounced, that is, the beam at the water line should be greater than at the gunwales. It should be of sturdy construction well battened especially at the ends under the deck, and the ends should be turned up (Huron Model) in order to better ride rough water. The canoe should always be turned upside down when not in use. Spruce paddles are lighter than maple and just as serviceable. An extra paddle should be carried lashed to the inside of the canoe.

Tents.—Tents may range from a 7′ by 9′ light weight canvas sheet to a good tent large enough to accomodate the prospector and his partner, depending on the season, country and means of transport. If only a fly is carried it is very necessary to take along a small mosquito bar, that is a small wedge tent made of mosquito netting large enough to cover a man in his sleeping bag. The extra weight is little and the extra comfort great. Of course, to be properly outfitted, a standard 7′ by 9′ tent with 2½′ walls or an 8′ by 10′ tent with 4′ walls should be carried.

Blankets.—Good wool blankets are very necessary and 3 pairs of a size 63 by 81 inches weighing about 10 lbs. a pair are needed for two men. A good bed can be made of spruce or balsam boughs.

Pack Sacks.—The waterproof types only should be considered, made of 12 to 18 ounce canvas with harness and tump line straps reinforced from the inside. The best size is 18 to 26 inches by 6½ inches. The width should not be too great because a pack projecting on both sides makes the going difficult particularly on a poor trail.

Pack Sheet and Tump Line.—Generally made of waterproof canvas of about 40 by 72 inches into which may be packed blankets, tent and perishable provisions.

Frying Pans.—Those made of steel are best because they will stand the heat of an open wood fire. It is useful to have them with a folded handle into which a stick may be inserted to make it longer.

Pails.—Aluminum pails are the most durable.

Axes.—A 2½ lb. single-bitted axe with a 27 inch hickory handle is the best type, and for periodical sharpening it is essential to carry a small axestone and file.

Fly Oil.—This is very essential and should not be forgotten. Buy the best and plenty of it. A good mixture is:—

1 pint pine tar
1½ pints olive or sweet oil
1 oz. citronella
½ oz. carbolic acid.

Fly Tox.—Is generally used to kill mosquitoes inside the tent at night. Oil of pine needles is said to be a simple and effective preparation for protection from mosquitoes.

The Compass.—The prospector should learn to rely upon his compass. He should learn to travel as far as possible from established water courses at the same time keeping a close check on his position. This is not only important for safety's sake but should a discovery be made, the exact location is desirable in order to make a proper plan of the claim as staked.

Every prospector should carry a notebook in which to record his daily observations.

Lastly and very important he should have a strong waterproof container for matches, some bandages, a bottle of iodine and one or two simple medicines such as tabloid laxatives.

Large provision bags capable of holding sacks of flour and sugar and made of paraffined canvas are worth the cost, while smaller bags of this type holding 2 to 10 lbs. keep the provisions clean and handy.

Clothing.—One of the most important items is a good pair of well-nailed boots either low or high but not over 12 inches high. Boots 18 inches high are stiff and costly and tend to bind the muscles of the leg. Woollen underwear is strongly recommended, heavy all-wool socks, khaki cotton pants, shirt of good weight, a sweater and a mackinaw or waterproof canvas coat.

SYNOPSIS OF REGULATIONS GOVERNING PLACER MINING IN ALBERTA

Copies of the Placer Mining Regulations, Regulations for the Disposal of Bar-diggings and the Regulations Governing Right of Entry may be obtained free from any Mining Recorder or from the Superintendent of Mining Lands, Edmonton. The Province of Alberta has been divided into four Land Agencies with a Mining Recorder in each Agency, namely, Lethbridge, Calgary, Edmonton and Peace River.

License.—No license of any kind is required to prospect on any vacant provincial land in Alberta, but written permission must be obtained from the owner or occupier to enter on land owned or lawfully occupied by another unless right of entry has been obtained by reason of an order of a Judge of the District Court.

Citizenship.—All persons over the age of eighteen years may stake and record a claim, without regard to sex, residence, or citizenship of the locator.

Number of Claims.—A prospector or locator may locate any number of claims but having recorded one claim he shall not have the right to locate another claim within the valley or basin of the same creek or river within sixty days of the date on which he has located the recorded claim, unless he has previously filed with the Mining Recorder a Power of Attorney from any number of persons not exceeding two, authorizing him to stake claims for them in consideration of their having enabled him to undertake the prospecting trip. He may then stake one claim of the ordinary size in the name of each such person within the valley or basin of any creek or river upon which he makes a discovery.

Form and Size of Claims.—The claim should be as nearly as posible rectangular in form and should be designated creek, river or inland claim.

Creek Claim.—Length not to exceed 500 feet, measured along the base line of the creek. The rear boundaries shall be parallel to the base line and 1,000 feet on each side of the base line, so that the claim includes the base of the creek.

Staking.—By two legal posts firmly fixed in the ground at each end of the base line (Fig. 9).

River Claim.—Shall be situated on one side of the river and shall not exceed 1,000 feet in length measured in the general direction of the river; the rear boundary which runs in the general direction of the river shall be defined by measuring 1,000 feet inland from the low-water mark of the river.

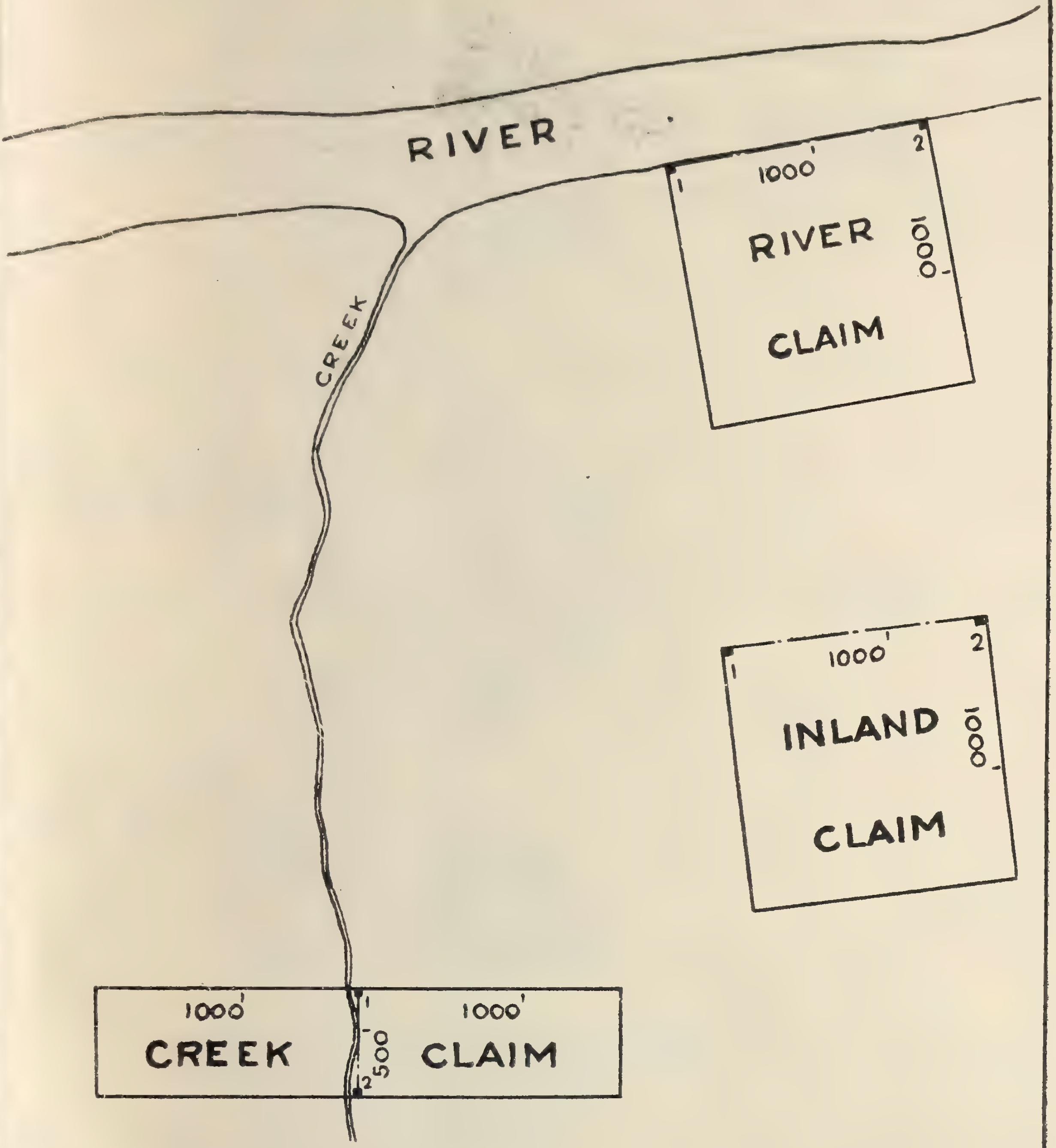
Staking.—By two legal posts firmly fixed in the ground at each end of the claim on the margin of the river. (Fig. 9).

Inland Claim.—Situated elsewhere than on a creek or river shall not exceed 1,000 feet in length by 1,000 feet in breadth. If claims front creek or river, they shall be staked in general direction of the creek or river towards which they front.

Staking.—By two legal posts firmly fixed in the ground in a line parallel to and on the side nearest the creek or river. (Fig. 9).

Staking General.—Line between posts shall be well cut out so that one post can be seen from the other if ground permits. One of the flat sides of each post shall face the claim and on each post shall be written on the side facing the claim a legible notice stating the name or number of the claim, or both, if possible, its length in feet, the date when staked, and the full Christian and Surname of the locator. The posts shall be No. 1 and No. 2 respectively. (Fig. 10).

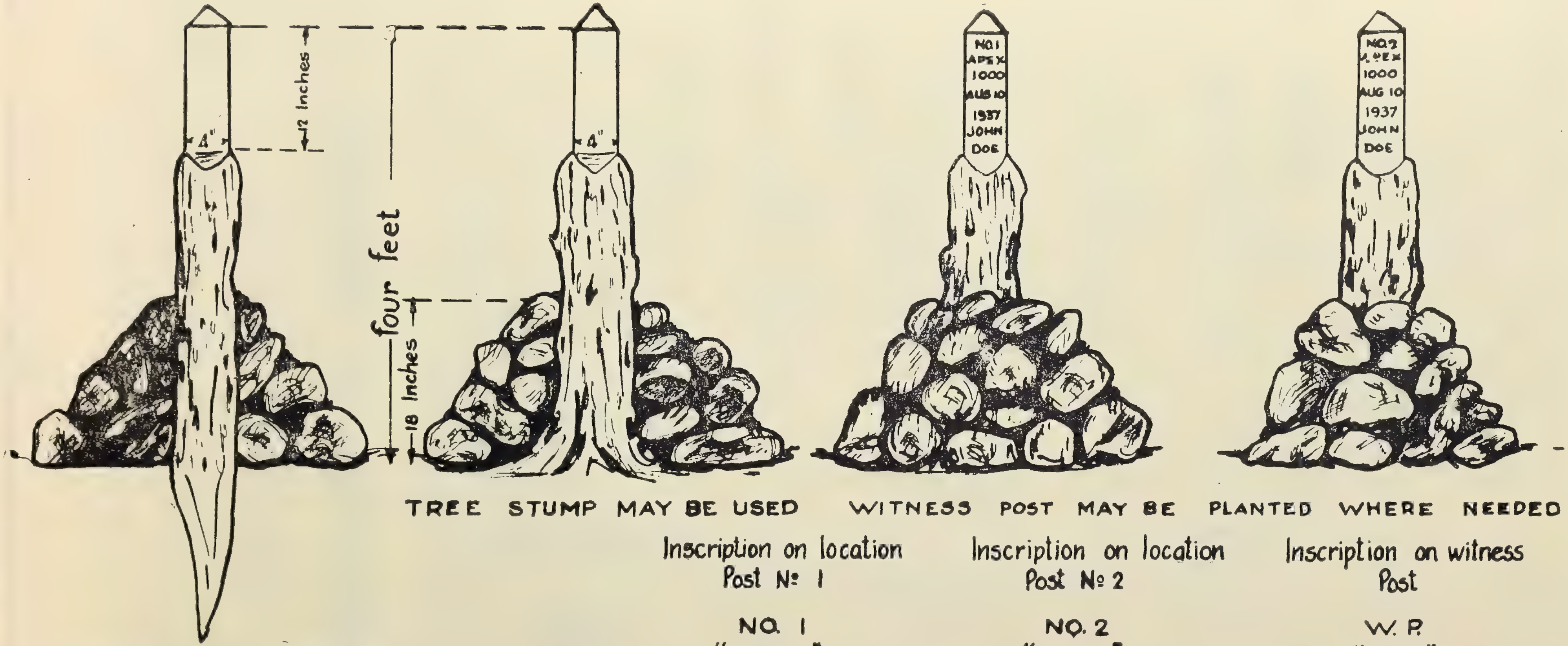
IX



EXAMPLES OF STAKING

PLACER CLAIMS

X



EXAMPLES OF POSTS WITH INSCRIPTIONS GIVING DIMENSIONS AND METHODS OF PLANTING

Inscription on location Post № 1	Inscription on location Post № 2	Inscription on witness Post
NO. 1	NO. 2	W. P.
"APEX"	"APEX"	"APEX"
1000'	1000'	AUG. 10
AUG. 10	AUG. 10	1937
1937	1937	200'
JOHN	JOHN	S
DOE	DOE	

Discovery Claims.—First creek claim on any creek or water course.

- One locator, one claim, 1,500 feet in length;
- A party of two locators, two claims, each 1,250 feet in length;
- A party of more than two locators, two claims, each 1,000 feet in length, and for each member of the party beyond two, a claim of the ordinary size only.

First river or inland claim on any river, hill, bench, bar or plain.

- One locator, one claim, 3,000 feet in length;
- A party of two locators, two claims, each 2,500 feet in length;
- A party of more than two locators, two claims, each 2,000 feet in length and for each member of the party beyond two a claim of the ordinary size.

The width of discovery claims remains the same as for ordinary claims.

Recording.—An application for a claim must be filed with the Mining Recorder for the district within ten days after staking if it is located within ten miles of the Mining Recorder's office. One extra day shall be allowed for every additional ten miles or fraction thereof.

Emergency Recorder.—In the event of a claim being more than 100 miles from the Mining Recorder's office and situated where other claims are being located the locators, not less than five in number, are authorized to meet and appoint one of their number as emergency recorder, who shall act in that capacity and accept applications from the locators on the prescribed form. The emergency recorder shall then notify the Mining Recorder and deliver the application and fees received for recording the claims.

Extension of Time.—Any person upon satisfying a Mining Recorder that he is about to undertake a *bona fide* prospecting trip, may, upon payment of a fee of $5.00, receive written permission from the Mining Recorder, allowing him to record a claim within the mining district at any time within a period not exceeding six months from the date of his staking such claim.

Assessment Work.—The owner of a claim shall be entitled to the absolute right of renewal from year to year thereafter upon payment of the renewal fee, provided such person does or causes to be done, work on the claim each year to the value of $150.00 in accordance with a schedule to be prepared by the Mining Recorder and files within fourteen days after the date of the expiration of the said period or renewal thereof with the Mining Recorder or his agent, an affidavit setting out a detailed statement of the work and stating that such work has been done.

If the owner of a claim has carried out assessment work but has failed to renew his grant thereon, the Mining Recorder may issue a grant to any person relocating the claim. The original owner has the right within six months after the date at which his grant came due for renewal to apply for cancellation of any grant so issued. This may be cancelled if the Mining Recorder is satisfied that the required work was done by the previous owner and upon such owner paying certain fees and paying out of pocket expenses and compensation for work done to the relocator.

A royalty is payable to the Department of Lands and Mines on the sales of any product of the location. The rate of royalty is from time to time fixed by Order of the Lieutenant-Governor in Council. At present this royalty is set at 37½ cents per ounce of gold.

Surface Rights.—Providing the claim is located on provincial lands a permit from year to year of all or a part of the surface area of a claim may be issued to the holder at a rental of $1.00 an acre per year.

Disposal of Claim.—A claim may be sold, mortgaged or disposed of providing the document giving all particulars of the disposal is deposited in duplicate with the Mining Recorder.

Grouping.—Owners of adjoining claims not exceeding ten in number may be granted permission by the Mining

Recorder, for a term of not more than ten years, to perform all the assessment work on one or more claims. By arrangement and payment of certain fees to the Mining Recorder the renewal dates of all such grouped claims must be adjusted so as to fall on the same date. Should a co-owner fail or refuse to contribute his portion of the expenditure required as assessment work on a claim his interests may become vested in the other co-owners by order of the Mining Recorder in proportion to their former interests.

Water Rights.—A license under the provisions of The Water Resources Act has to be obtained before any water may be diverted or made use of for the working of a claim.

Fees.—

For grant of a claim for one year	10.00
For renewal of a grant of a claim	10.00
Recording each Power of Attorney	5.00
Registration of any document for each claim	5.00

BAR-DIGGINGS

A permit may be applied for to stake out and work bar-diggings the property of the crown. Staking should be done in accordance with the Placer Mining Regulations, the claim being of the same shape and size.

The permit fee is $2.50. All permits expire on the 31st of March of each year. As long as the holder of a permit continues to work his claim to the satisfaction of the Mining Recorder he may have it renewed, but, if the claim remains unworked for ten consecutive days, the right shall absolutely lapse unless a lay-over has been granted by the Mining Recorder.

A royalty similar to that under placer mining is payable on the product of the claim.

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